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THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

DEVOTED TO THE ADVANCEMENT OF ASTRONOMY AND ALLIED SCIENCES

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Articles **Page**

The Unknown Country ..... *Andrew Thomson* 41

Annual General Meeting of the R.A.S.C.

Minutes of the Annual Meeting 52
Report of the General Secretary 53
Report of the Librarian 57
Chant Medal Presentation 57
Reports of Secretaries of the Centres 59
Report of the General Treasurer 70
Reports of the Treasurers of the Centres 72
Officers of the Society for 1950 77

Out of Old Books

Charles Babbage and the Calculating Machine..... *Helen Sawyer Hogg* 79

Notes and Queries

Astronomical League Convention (*Charles A. Federer, Jr.*); The Romances of Computation (*C.A.C.*); Solar Eclipse Party, 1952.... 85

Meetings of the Society

At Ottawa—At Saskatoon—At Edmonton 87

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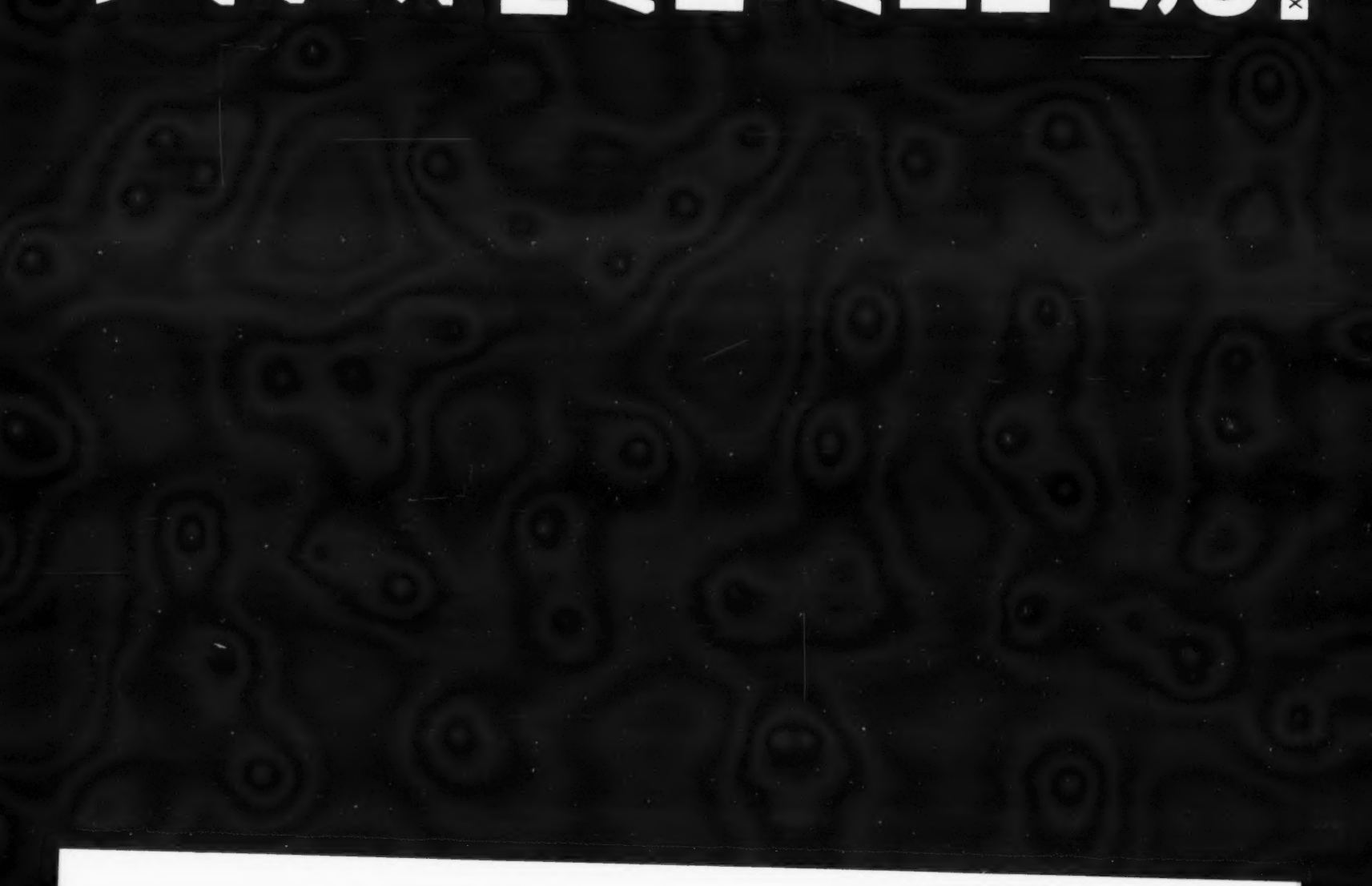

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THE UNKNOWN COUNTRY*

BY ANDREW THOMSON

IT is over four centuries ago that Cabot sailed up the St. Lawrence and began the exploration of Canada. There still remains a vast extent of our country to be explored—probably more than in any other country in the world. It seems almost incredible in these days of air travel that it was possible as late as 1947 to discover an uncharted island within the confines of Canada larger than the whole province of Prince Edward Island. Yet this island in Arctic Canada which has been named Prince Charles Island after Prince Charles, who we hope will some day be our king, is less than 1200 miles from Toronto.

Tonight I wish to explore with you a part of Arctic Canada, that really "unknown country", vast and extensive, about which so much remains to be learned.

There are the old, mythical definitions of the Arctic, such as, "the region of perpetual snow and ice," or "the region where one lived like a dog, worked like a dog and finally ate one's dog". From a geographical standpoint, the arctic is the region north of the Arctic Circle which lies at latitude 66° 30'N. However, the term "the Arctic" has been used at times in a general sense to refer to the region north of the tree line or to the area north of the mean July isotherm of 50°F.

Tonight I wish to talk to you more specifically about the Arctic Archipelago, that portion of the Canadian Arctic lying north of the continent and referred to officially as the District of Franklin.

*Address by the President of the Royal Astronomical Society of Canada, at the Annual At-Home, in Toronto, January 13, 1950.

The Franklin district has an area of 549,253 square miles which is 14.9% of the whole area of Canada. It is larger than any province of the Dominion and is in fact larger than two average-sized provinces like Alberta and Saskatchewan.

Franklin district is composed entirely of islands of which sixteen have an area greater than 2000 square miles. These range from Baffin Island with 197,754 square miles to Amund Ringnes which has 2027 square miles. Great Britain (England, Scotland and Wales) with an area of about 88,000 square miles would hardly cover half of Baffin Island. The areas quoted here are taken from the Canada Year Book but other reference books give areas from 5% to 10% at variance with these figures. Similarly the total coast line of Canada is given as 49,470 miles over half of which 26,786, is in these Arctic islands. From north to south, that is from Cape Sheridan on Ellesmere Island to the southern tip of Baffin Island, is 1400 miles and from east to west Franklin territory extends 1700 miles.

If Franklin territory is the unknown country then the Arctic is the great unknown ocean. It is much smaller than the other oceans and is considered to be relatively shallow. Nevertheless, at the North Pole the water is about 14,000 feet deep and a depth of 17,850 feet has been measured north-east of the Behring Strait at 78°N., 175°W. The greater part of this ocean is covered with solid pack ice but in recent years, along the shores of Siberia there has been sufficient open water for two or three months in the summer to permit U.S.S.R. ships to move freely, although 30 years ago coastal navigation in this area was too uncertain to be trusted as a commercial operation.

On the Canadian side of the Arctic Ocean the ice pack remains fairly solid north of Cape Kellett, Banks Island, the year round. The rise and fall of the tide is only 2 or 3 feet and the ice is attached firmly to the shore. On the east coast of Baffin Island, the tide range is much greater. At Frobisher village the highest tides are over 50 feet in September. These tides, which are of the same order of magnitude as those in the Bay of Fundy, break loose the land-fast ice and it is floated away under suitable wind conditions. The ice layer on a fresh water pond in the Archipelago reaches a maximum thickness of about 8 feet in a single season. It is believed that the greatest possible thickness of sea ice is less than 10 feet unless layers have been piled up on top of one another.

The Arctic Archipelago can be conveniently divided into three parts. The northern portion includes all the islands north of the long strait which runs clear through from Baffin Bay to Beaufort Sea. The remainder of the Archipelago is divided roughly by the Boothia Peninsula into the south-eastern section which is supplied by shipping from the east and the south-western section which receives its supplies either via the Mackenzie or around Point Barrow.

There are no Eskimos living in the northern portion of this territory except two families which assist the R.C.M.P. Constables at the Dundas Harbour detachment on Devon Island. According to the 1941 census there was a grand total of 7205 Eskimos in Canada of whom 5404 were located in the Northwest Territories. My guess would be that less than 1500 Eskimos have their permanent home on the Archipelago. The pictures of Eskimos to be shown later on give an idea of the present status of these people whose culture is changing rapidly.

The islands are not uniform low flat areas of snow and ice. A mountain range nearly 1500 miles long with high rugged peaks reaching heights of 12,000 feet at its northern end, extends along the eastern side of the region from Ellesmere Island to the southern tip of Baffin Island. The scenery at the northern end of Ellesmere Island is incredibly grand. Long twisting glaciers fill many valleys and flow down into the sea.

On the south-western side of the Archipelago the islands are low and rolling although a few hills reach an elevation of about 2000 feet on Victoria Island.

Historical Summary

The story of the exploration of the Archipelago would make a dramatic theme for Canadian poets to tell in epic verse. Perhaps some Canadian poet may yet write a saga concerning Hudson or Franklin or Parry or any one of half a hundred Heroes of the North. Arctic discovery has been paid for in the past by blood and pain and suffering and death, and more people have died in their attempts to chart the Arctic Archipelago than are now living in it.

The search for a north-west passage around the northern boundary of North America was the most frequent incentive of the early Arctic explorers, and no less than 186 expeditions were organized for this

purpose. After 1850, their object was usually either the search for Franklin or the discovery of the North Pole.

Martin Frobisher, in 1576, was the first to seek the North-west Passage to the Orient. The next attempts were made by John Davis who made a voyage in each of the years 1585, 1586 and 1587 to the Strait that now bears his name. These expeditions by Davis were carried out on a comparatively large scale, with a total strength of four ships in 1586 and three ships in 1587. Although Davis did not penetrate very far into the channels of the Archipelago, his expeditions accomplished the charting of much of the long coastline of the south-east sector.

These early expeditions to the Arctic were of great value and they stirred the spirit of adventure that made the Elizabethan age glorious in British history.

At the same time as these expeditions were going on, a lucrative trade was developed by ships trading with Siberia. Thus Hudson had already achieved a great record of exploration in his attempts to reach China by he North-east passage before he sailed in 1610 in the little ship "Discovery" into Hudson Strait and the great Bay which now bears his name. The Discovery was imprisoned by ice in the south-west corner of James Bay and he was compelled to winter there. On his voyage home in the following Spring his crew, fearing that there would not be enough food to last for the whole voyage, mutinied and set Hudson and eight others adrift in a boat. Thus, Hudson perished in the seas he had discovered.

Our knowledge of the Arctic has been gained by the sacrifice of men and money. Even now to gain additional information about the Arctic still requires fortitude on the part of the men who go there and entails the expenditure of large sums of money, but I can only plead that there are abundant rewards.

In Hudson's ship, refitted by Baffin and Bylot, a voyage was made by these explorers in 1616 up Davis Strait beyond the farthest point reached by Davis and continued into the waters which are now called Baffin Bay. The openings into Baffin Bay including Smith Sound at the north, Jones Sound and Lancaster Sound to the west were named by Baffin after his promoters. On this voyage Baffin sailed more than 300 miles farther north than his predecessor and for 236 years his farthest north (about 77° 45′) remained unsurpassed. The

discovery by Foxe of Foxe Basin in 1631 closed the first chapter of discovery of the Canadian Arctic Archipelago and nothing further was done until after the end of the Napoleonic Wars.

In the years 1815 to 1817, the Arctic ice on the eastern coast of Greenland floated southward to such an extent that in 1818, Scoresby asserted that "18000 square miles of the Greenland Seas included between the parallels 74°N. and 80°N. were perfectly void of ice, all of which had disappeared within the last two years." In view of Scoresby's reputation, this statement provided an impetus to polar exploration.

This enthusiasm for exploration was further stimulated in 1818 by a reward of £20,000 offered by the British Government to the discoverer of the North-west Passage and another £5000 for reaching 89°N. Proportionate sums were to be paid for partial discoveries and also for explorations by way of Spitzbergen.

The termination of the Napoleonic Wars set free a number of experienced sailors so that with ice conditions in the Arctic believed to be the best for navigation in several centuries and with financial rewards of an incredibly generous size, a new era of discovery was introduced. In 1818 an expedition under Captain John Ross and Lieut. Edward Parry sailed westward to Baffin Bay, confirmed Baffin's discoveries and entered Lancaster Sound. As he was about to proceed up the Sound, Ross thought he saw a mountain barring the opening, and, against the advice of his fellow officers, he returned to England.

The next year Parry set out with two ships, the *Hecla* and the *Griper*, to examine Lancaster Sound and proved that no land blocked the passage but that a wide channel led into an unknown region. The enthusiasm of officers and men was at a high pitch for new discoveries were made every watch, as the ship sailed westward. They could use the words of the Ancient Mariner "We were the first that ever burst into that silent sea". Sailing along past our present weather station on Cornwallis Island, Parry won the Government's £5000 prize for passing the halfway mark from Greenland to the Bering Strait.

Parry continued westward until further advance was prevented by the approach of winter. A good harbour, subsequently named Winter Harbour, was found on the south shore of Melville Island and Parry decided to winter there. The ships were decked over, and Parry and his crew remained in the best of health throughout the winter.

On August 1st, 1820 the ice opened sufficiently to release the ships and Parry tried vainly to sail farther westward. On several occasions his ships barely escaped being nipped between ice floes. On August 26th, he ordered the ships to turn back and after only brief stops reached England on October 30th. This was one of the greatest of Arctic voyages and marked the beginning of a new era in exploration.

Parry was the originator of many modern techniques to build up morale. Let me quote from his writings: "I proposed therefore to the officers to get up a play occasionally on board the *Hecla* as the readiest means of preserving among our crews that cheerfulness and good humour which had previously subsisted." This was not always easy for we read later on: "On the 16th of February, the thermometer descended to –55°; the less to have been expected as the old year had closed with mild weather. Notwithstanding the low temperature of the external atmosphere the officers contrived to act as usual, the play announced for this evening; but it must be confessed that it was almost too cold for either the actors or the audience to enjoy it, especially those of the former who undertook to appear in female dress".

There was no lack of enthusiasm for a few years and expeditions to the Arctic followed one another in rapid succession. It was not, however, until Franklin's tragic expedition that any considerable contribution was added to our knowledge of the Archipelago. Franklin set out in May 1845 to make a new effort to conquer the North-west Passage with 129 officers and men and two ships. The ultimate fate of these men has not been definitely established, but it is almost certain that every man died within the next four years. However, as a result of their deaths more Arctic exploration was accomplished than they could ever have done in their lives. A total of 40 expeditions engaged in the search for Franklin, spending through a decade nearly $4,000,000. As a result of the various relief expeditions, 7000 miles of coastline were surveyed, mostly in the Canadian Archipelago.

Franklin's records have never been found, but in 1859 McClintock's expedition secured the evidence which established the main part of the sad story. Some parts are still open to conjecture. It appears that Franklin, after wintering on Beechey Island, sailed around Cornwallis Island and then headed southward down Peel Channel. His ships were caught in the ice and Franklin died on June 11th, 1847, according to a record subsequently found.

In the summer of 1848, Franklin's successor was compelled to abandon ship and to set out with 105 survivors who were then enfeebled by three successive winters in the Arctic. The remains of a number of the crew were found on the shores of King William Island and on Adelaide Peninsula. On Cape Crozier, McClintock found a boat mounted on a sledge with a total weight of 1400 lbs. Inside the boat were two skeletons, five watches, two double-barrelled guns, 5 or 6 small books mostly religious, silk handkerchiefs, towels, soap, sponge, tooth brush, hair combs, twine, nails, saws, files, bristles, wax ends, powder, bullets, shot, cartridges, a little tea, 40 lbs. of chocolate, 11 spoons, 11 forks, 4 teaspoons and 26 pieces of plate. It is difficult to understand how the crew could perish with so many supplies still on hand. There must have been both very bad management and very bad luck.

After Franklin's tragic expedition, the whole world realized that even if a North-west Passage were discovered, its use as a sea route to the Orient would be impractical. Thus, the attention of polar explorers was focused on the discovery of the North Pole instead. The first person to complete the North-west Passage in one ship throughout, was Amundsen in 1904-1906 in the little sloop *Gjoa* (pronounced Yea). He sailed through Lancaster Sound, then along the west coast of Boothia Peninsula, and, after spending two winters near the then position of the north magnetic pole, proceeded along the coastline of the mainland to the mouth of the MacKenzie.

The second passage was made by the *St. Roch* which sailed from Pond Inlet on August 17th, 1944. After coasting along the north shore of Lancaster Sound to Dealy Island and then southward through the narrow Prince of Wales Strait they reached the Hudson Bay post on Holman Island on September 4th. The *St. Roch* required only 18 days to traverse the Northwest Channel and reached Vancouver on October 16th, 1944, less than 3 months after she left Halifax.

Climate

Since the Arctic covers a vast area its climate varies considerably from place to place. Sir Hubert Wilkins used to generalize that the south-eastern sector was stormy whereas the western Arctic was relatively calm. The storminess of the eastern sector results from invasions of warm moist air moving up the Davis Strait from the

Atlantic Ocean. On the other hand, the mountainous Aleutian Islands provide a barrier which prevents moist air from the Pacific from drifting into the western Arctic.

The fundamental source of the energy which brings about storms, precipitation and temperature changes, is the radiation from the sun. On June 21st, Cape Sheridan on the northern tip of Ellesmere Island (only 400 miles from the Pole) receives about the same amount of solar radiation as Pelee Island at the southern extremity of Canada. During the 24 hours of continuous sunlight at Cape Sheridan, the sun is at a low altitude varying from 16 degrees above the horizon at midnight to 30 degrees above the horizon at noon. Pelee Island receives sunlight for only about 15 hours on the summer solstice but the sun at noon is 75 degrees above the horizon. The long duration of summer sunshine in the Arctic is not nearly as effective as one might otherwise think, on account of the obliquity of the sun's rays. Unfortunately, we have only one year's record from Resolute of 1287 hours of bright sunshine, which compares with an annual average of 2048 hours at Toronto.

The Arctic winter night is not nearly as dark and utter black as it has been painted or rather reported. It is nothing like the deep velvety darkness of tropical night. On January 5th, 1950, our observer at Isachsen sent a radio message that he was able to read a newspaper outdoors at noon by the light from the southern sky. Even when the sun is continuously below the horizon, there is a considerable amount of twilight near noon when the sun approaches the horizon.

Another factor that relieves the darkness is the long period of moon light. Near the time of full moon, the moon does not set for several days.

Auroras are rather infrequent in the far north. At our Resolute Station in the winter of 1947-48, the Officer-in-Charge, Mr. R. W. Rae, saw a bright aurora on three nights only, whereas here in southern Ontario considerably brighter displays occurred and more than twice as often.

Cloud

Winter skies are generally clear, although during calm periods, the air is usually filled with minute ice crystals. When the ice begins to break up in late spring, the cloudiness increases and remains high

all summer. After freeze-up occurs towards the end of September, the cloudiness once more decreases.

Common phenomena during the winter are the storms of blowing snow which occur on the average about once every two weeks. If the wind speed increases above 15 MPH, the tiny snow particles begin to be carried aloft from the surface, and if the wind is higher than 40 MPH, the air is so completely filled with snow crystals that the visibility is reduced to near zero.

Temperature

The temperatures throughout the Franklin District are obviously low, ranging from an average annual temperature of 21°F. at Resolution Island (Southern tip of Baffin Island) to 3.5°F. at Eureka. Eureka has only been established for two years and it has reported the surprisingly low mean temperature of –43° for the month of February. As Mr. Wonders has mentioned, Eureka appears to be a second "cold pole" as a rival to Verkhoyansk in eastern Siberia.

March and April witness the slow and irregular retreat of cold temperatures, the retreat being most rapid in the south-east sector of the Territory. By May, about half of Franklin Territory is above zero, and by the end of June, above-freezing temperatures occur over the whole vast area. The highest mean monthly temperature occurs in July, and this ranges from about 40°F. at Isachsen to over 50°F. in Baffin Island.

The temperature begins a steady decline in August, and shows a decided drop in early September with the onset of winter. By the end of September, temperatures are below freezing over the entire area, and below zero over the northernmost islands. The mean temperature continues to fall throughout the winter to a minimum in February.

Although there is no other station in Canada so consistently cold as Eureka during February, much lower temperatures have been observed elsewhere in Canada. The all-time low temperature for Canada of –81.4°F. was observed at Snag, Yukon Territory, and even in Ontario, a record of –73°F. has been observed at Iroquis Falls, whereas, the lowest at Eureka was –65°F. in March 1948. The lateness in the winter season for the occurrence of the minimum is typical of the Archipelago and as Wonders has pointed out is probably

due to the thickening of the ice and the growing depth of snow. The obliqueness of the sun's rays inside the Arctic Circle reduces the heating effect to such an extent that the temperature has been known to fall to –31°F. on a day when the sun was shining for over 17 hours.

In the south-eastern sector, spells of mild weather or thaws occur during the winter when the temperature rises to the freezing point. These thaws rarely extend as far north as Eureka or as far west as Resolute, and are caused by systems of low pressure centered in Quebec or Labrador which pump relatively warm maritime air from the Atlantic into the eastern Arctic in a vast vortex.

Throughout the Arctic, maximum temperatures over 60°F. may be expected in most years and even in the most northerly parts, a maximum of 50°F. will occur in all years.

During the summer months, the sun is continuously above the horizon and during the winter, the sun is below the horizon for a corresponding period. Consequently, the normal diurnal range of temperature from a minimum in the early morning to a maximum in the afternoon is not appreciable except in the spring and fall. During the Arctic night the daily range is almost zero.

Variability of temperature regime from year to year in the Archipelago is of great importance, both locally and abroad. All observations from our weather stations indicate that the winters vary a good deal, but that the rest of the seasons are very similar from year to year. Thus, there may be mild winters like 1945 or severe winters like 1947, but there are no outstanding warm or cool summers. The relatively small variation in mean summer temperatures is brought about by the extensive ice-filled polar waters which quickly modify the air in contact with them.

There are great variations in the air temperatures at all levels from the surface up to 50,000 feet. These temperature ranges, which are much greater than are found in the tropics, provide an illustration which points up the importance of a knowledge of Arctic Meteorology in weather forecasting.

Precipitation

The erroneous belief that there are great snow falls in the Arctic is widely held. Toronto, in its famous snow fall of December 11th and 12th, 1944, had about 22½ inches, the same snowfall in 24 hours as Eureka, our most northern station will normally have in two years.

The average for Eureka in the past two years was 12.6 inches. In the Arctic the air is generally so cold that water vapour can not exist in any quantity. Eureka has actually the least precipitation of any station in Canada, namely, 1.5 inches per annum if reduced to a water equivalent. Death Valley in California has an annual precipitation of 1.4 inches which is the least for any station in North America. Farther south the annual precipitation increases to 6.4 inches at Resolute and 9.6 inches at Frobisher. The snow is light and fluffy and often one cannot tell whether it is falling or being blown along the surface. Any obstruction will produce very hard drifts of snow, so closely packed, that a light tractor can be driven over them without breaking through the crust.

Since the snow cover in the open is usually only 6 inches to 18 inches deep, it is easy to understand how quickly the snow will disappear in May or June. Rainfall is a summer phenomenon but it does occur even at the North Pole. Hoar frost and rime occur at times and form a source of water which amounts to perhaps 15% of the annual total of rain and snow.

Fog and mist occur widely during the summer, and during the winter whenever open water is exposed by a crack in the ice, columns of sea smoke occur. Visibility is best in April and May when the fog of summer does not yet prevail and when the winter ice crystal haze is infrequent.

Although many scientific investigations have been carried out in the Arctic, there still remains much to be done. Our knowledge concerning its birds, mammals, vegetation, minerals, and so on, is far from complete. We can learn from reports of earthquake stations in temperate latitudes that this "unknown country" is not free from earthquakes. A fairly active centre of seismic activity is located near Prince Patrick Island, and southern Baffin Island has experienced at least one severe shock.

Why should our Government extend its work in the Arctic? Not because of its wealth in furs or minerals although they may be there. Fundamentally, because Canada should not leave a large area, 15% of its whole extent, uncharted and unknown. Furthermore, there is a charm in the exploration and the search of these Arctic Territories that should be a source of inspiration to our national life.

Meteorological Service of Canada,
315 Bloor St. W., Toronto, Ontario.

MINUTES OF THE ANNUAL MEETING OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

The Annual General Meeting was held in the McLennan Laboratory of the University of Toronto at 8.00 p.m., Monday, January 9, 1950; the President, Mr. Andrew Thomson in the chair.

Moved by J. H. Horning, seconded by E. J. Kennedy, that F. L. Troyer act as Recorder pro tem in the absence of the Recorder, H. W. Barker.

Minutes of the Annual General Meeting of January 10, 1949, were approved as printed in the JOURNAL, March-April, 1949.

For the purpose of counting the ballots returned by mail, Mrs. E. Todd, the assistant secretary, and Mr. Alex Milne were appointed scrutineers.

General Secretary's Report. The report on highlights of the Society's activities in 1949 was presented by the General Secretary who moved its adoption and publication in the JOURNAL, seconded by A. R. Clute.

On motion of Mr. Barker (in absentia), seconded by Mr. Kennedy, a resolution was presented congratulating Dr. Helen Sawyer Hogg on her winning of the Annie Jump Cannon Prize of the American Astronomical Society. The meeting unanimously approved this resolution and directed it be printed in the JOURNAL as part of the General Secretary's report.

General Treasurer's Report. Moved by Mr. Horning, seconded by Mr. George T. Dale that the financial statement be adopted and be printed in the JOURNAL. Carried.

Moved by Mr. Kennedy, seconded by Mr. Horning, that Mr. Barker and Mr. Clute audit the books of the General Council. Carried.

Librarian's Report. This was presented by Dr. D. W. Best who moved its adoption, seconded by Mr. J. R. Collins, the report to be published in the JOURNAL. Carried.

Editor's Report. Moved by Dr. Frank S. Hogg, assistant editor (in absentia) and seconded by Mr. Horning that the report of the Editing Committee be received. Carried.

Moved by Mr. Horning, seconded by Mr. Kennedy, that a vote

of thanks be extended to the Editors and all who had assisted in the preparation of the Society's publications. Carried.

Scrutineers' Report. The scrutineers having returned, Mr. Kennedy then read their report. 360 ballots had been received for Officers and Council. With a few exceptions where a name was substituted for Council, they were cast for the slate as presented. Of 314 ballots on the two questions submitted, all but 18 were in favour of changing the name of the "General Council" to "National Council" and all but 13 in favour of the recommended change in the method of electing additional members of Council. The President declared the election of the Officers and Council for 1950, as printed on the ballot.

The President expressed appreciation of the work of the new assistant secretary, Mrs. E. E. Todd, in keeping the Society's records, and a formal resolution moved by the General Secretary and seconded by the General Treasurer to this effect was unanimously carried.

Moved by Mr. George T. Dale, seconded by Mr. J. R. Collins, that a vote of thanks be extended to all members of the Executive and Council for their services during the past year. Carried.

The meeting was then adjourned.

FREDERIC L. TROYER, *Recorder, pro tem.*

REPORT OF THE GENERAL SECRETARY

The fears of some that raising our fees as we did during 1949 would result in a drastic decrease in our membership have not been realized. While our numbers are not quite up to the 1948 total, this has been due principally to the new policy of the General Council in purging the membership lists of all delinquent members. Due to the financial stringency it was necessary to abandon our too generous gesture of continuing on the mailing list of our publications those who were behind in payment of their fees, sometimes even over a year. The new plan is to stop sending publications after a six months period in arrears, a letter having been sent previously to each member so advising them. The Council appreciates the co-operation the centres have shown in supplying this office with the necessary information on their lists. This year about 275 have been stricken from the lists following the new policy.

Three meetings of the General Council were held during the year and several important projects were discussed and decided upon. The government having appointed a Royal Commission to inquire into the cultural development of the Arts and Sciences in Canada, it was thought advisable to appoint a Committee to present a brief and appear before the Commission. This brief has been prepared setting out the aims and objects of the Society and its impact and influence on the cultural life of Canada. The Committee is fortunate in having Mr. Andrew Thomson as Chairman, the other members are, J. H. Horning, A. R. Clute and E. J. A. Kennedy.

Another matter before the Council was the amending of the Constitution increasing the representation on the General Council as the centres increase in number. We have now fourteen centres with only twelve elective members on Council. It was also thought advisable to change the designation of Council to National instead of General. These changes have been presented in a ballot to the members.

The idea of having a planetarium established in Toronto is still alive in the minds of the membership of Toronto Centre. As a projector was unobtainable during the war years, active work of the committee was at a standstill. Information has just been received that the Zeiss Projector is again in process of manufacture and may be available in the near future.

Hamilton is to be congratulated in financing and procuring a Spitz Projector manufactured in the United States. This small planetarium was presented to McMaster University by the Hamilton Centre and is available to the centre for use at their meetings. The University has built a dome and will be responsible for the upkeep. The Department of Mathematics will use it in their courses of astronomy. The cost of this projector was about $1,100.

Reports of the centres appended make interesting reading. They indicate increasing support of the public as well as the members in the meetings. An increase in the observational and research activities of a number of the centres will be noted. The use of the attractive and educative astronomical films now available is a great help to this end. The Council purchased one of these films, "Movement of Solar Prominences", which has been on loan to the centres. It has been in constant use by them during the year.

The Chant Medal for 1949 has been awarded to Mr. Frank Sisman of Hamilton Centre. Unfortunately Mr. Sisman suffered a stroke recently and is unable to appear at the At-Home for the presentation. He has delegated Mr. W. D. Stewart to receive it on his behalf.

The Society can be justifiably proud in the announcement that one of our most valued members, Dr. Helen S. Hogg, has been awarded the Annie J. Cannon Medal. A resolution is being submitted to this meeting expressing our congratulations.

We regret that Winnipeg reports the death of Dr. L. A. H. Warren, their Honorary President. Winnipeg will miss Dr. Warren who has been active in the affairs of the Society for many years.

We would like to enlist the support of the centres in getting advertising for our JOURNAL and *Observer's Handbook*. Your influence with some of the companies who could make use of our valuable medium will be appreciated. Rate cards are available on request.

The writer wishes to acknowledge gratefully the fine co-operation of the Secretaries of the centres in supplying the information and reports needed by General Council. The Editors of the JOURNAL and contributors to the Handbook are particularly deserving of the thanks of the Society for the amount of arduous voluntary work in preparing the publications and more so now that funds are so scarce.

The Society is fortunate in having the active interest and valued council of Dr. C. A. Chant in its affairs, particularly in the publication of the JOURNAL. In point of years as a member, Dr. Chant is probably our oldest. He joined the Society in 1892. We wish him many years of continued good health and usefulness in his chosen profession.

RESOLUTION SUBMITTED TO THE ANNUAL MEETING

The members of the Royal Astronomical Society of Canada desire to extend to Dr. Helen Sawyer Hogg our heartiest congratulations upon the signal honour which has come to her in the bestowal by the American Astronomical Society, at their annual gathering held in Tucson, Arizona, last month, of the Annie J. Cannon medal and accompanying emoluments.

This coveted award, given every three years for the most outstanding contribution by women astronomers of the world, comes to Canada for the first time.

Dr. Hogg's high achievements in the field of astronomical research, pertaining especially to the composition and movements of variable stars and globular clusters, are well known throughout the entire scientific world, and all astronomers must agree that this honour is well merited.

Dr. Hogg has generously acknowledged the assistance received from her associates at the Dunlap Observatory, of which her husband **Dr. Frank S.** Hogg is the Director; but the major honour rightly belongs to her.

The granting of this award to Dr. Helen S. Hogg brings credit also to Canada, and especially to the University of Toronto, and, it might be added, to the Royal Astronomical Society of Canada, of which organization, we are proud to say, Dr. Hogg is a highly-esteemed and most active member.

MEMBERSHIP ON DECEMBER, 31, 1949

	1948	1949
Toronto	334	367
Ottawa	80	70
Hamilton	58	49
Winnipeg	35	34
Montreal	270	266
Victoria	127	110
London	38	40
Vancouver	47	36
Edmonton	58	53
Quebec	76	63
Windsor	72	49
Saskatoon	35	26
Guelph	96	33
Centre Français de Montréal	48	58
Members unattached to Centres		
Canada	84	66
U.S.A.	331	327
Other Countries	34	32
Life Members not included in Centres	28	32
Subscribers	90	104
University of Toronto Library	75	50
	2016	1865

E. J. A. KENNEDY, *General Treasurer.*

Report of Librarian

During the year 1949 periodicals were sent in exchange to:

Canada and the Empire	37
United States of America	45
Other countries	34
	116
The number of books lent from the shelves was	88
Expenditure for binding periodicals	$19.66

Back numbers of the Journal have been sent to several observatories in Europe in response to their requests.

It is gratifying to note that in the present quarters with more shelf space available, it has been possible to re-arrange the books, bound copies as well as back numbers of the Journal, so as to make them more readily available; also the more spacious reading room is appreciated for its better facilities for study and research, readers finding the magazines and exchanges conveniently arranged.

D. W. Best, *Librarian.*

CHANT MEDAL PRESENTATION

At the Annual Meeting of the Royal Astronomical Society of Canada, on January 9, 1949, the award of the Chant Medal for 1949 to Mr. Frank Sisman of Hamilton Centre, was announced.

The presentation was made at the At-Home of the Society. In the absence of Professor Kingston, the Chairman of the Chant Medal Committee, the report of the Committee was read by Mr. E. J. A. Kennedy, the General Secretary. As Mr. Sisman unfortunately was ill, Mr. W. D. Stewart received the medal on his behalf, expressing Mr. Sisman's appreciation and also that of the Hamilton Centre.

From the document submitted by the executive of the Hamilton Centre, the following is taken:

Mr. Sisman has been an active member of the R.A.S.C., Hamilton Centre, for fourteen years, having joined in 1935. He has devoted a large part of his time to astronomical interests, particularly to the practical aspects of observation and telescope making. For many years it has been his pleasure to gather small groups together and spend an evening with his telescope observing the heavens. This has done much to advance interest in astronomy on the part of the public.

He built his telescope in 1937; it is a six-inch Newtonian reflector, polar mounted, clock driven with governor and clutch. It is equipped with decli-

nation and right ascension circles respectively reading to one degree and one minute of time. The telescope is equipped with a smaller finder which is mounted on a right angle offset so that it can be moved to either side of the tube. A cap fits over the objective and is so made that a polarizing aperture may be used for direct viewing of the sun.

Soon after completing his own telescope, Mr. Sisman built a three-inch alt-azimuth Newtonian reflector followed by a four-inch alt-azimuth Newtonian. In 1942 he made a four-inch polar mounted Newtonian with a revolving eye-piece; it is equipped with right ascension and declination rings. His latest product is a six-inch polar mounted Newtonian with rotating eye-piece, and equipped with right ascension and declination rings. A ring and bead sight is mounted as a finder. Three small spirit levels in the platform aid in orientation. His telescopes are characterized by extreme sharpness of image. This is due to accuracy of the optical parts. He is not finished with a mirror until the paraboloidal figure passes a rigid optical test.

Mr. Sisman makes his own Ramsden eye-pieces for his telescopes. He also makes special high magnification eye-pieces to order for astronomers. He is an expert with optical flats. He has made his own set of master flats on which he tests the flats to be used as diagonal mirrors. In testing the flats for diagonals, the Newton's rings are scanned with the aid of monochromatic sodium vapour light. In making the flats Mr. Sisman tests them with both vertical and horizontal knife edge.

Mr. Sisman built a reciprocating machine for grinding and polishing his mirrors. He built a lens-making spindle which operates vertically for grinding and polishing lenses, then can be adjusted to a horizontal position for the purpose of edging and centering lenses. He set up a Foucault mirror testing bench, which he also employs as a lens bench. In addition to equipment already mentioned, Mr. Sisman also has in his home shop the usual power tools found in the handy craftsman's shop.

He has always been ready to help and advise amateur telescope makers. He has spent hours with others in working out their problems. He has demonstrated in his kindly way many times that nothing is too much trouble for him when an optical problem is presented, whether it concerns a Newtonian telescope, a refractor, or binoculars.

W. D. STEWART

REPORTS OF SECRETARIES OF THE CENTRES

Toronto Centre

Sixty-four new members were elected during 1949 and three others added to our roll by transfer from other Centres. The total membership of the Centre, including 19 Life Members, reached a new record of 367.

Eleven regular meetings were held, including one joint meeting with the Royal Canadian Institute and the annual Members' Night at the David Dunlap Observatory at Richmond Hill. Four "Star Nights," one for members only and the other three open to the public, were arranged for the University of Toronto campus during the summer months but bad weather forced cancellation of two of the public nights. The Council held two formal meetings and the Executive met on several occasions to conduct the routine business of the Centre.

A new record was established by the Centre's Telescope Display at the Canadian National Exhibition when 7,190 persons viewed objects through the telescopes which were set up on 11 of the 14 nights of the "fair." On four nights the number in the queue passed 900; on busy evenings six telescopes were in use, in pairs of a refractor and a reflector. Each visitor was given a complimentary copy of the four-page "Sky Facts" leaflet prepared by the Centre. We again were grateful to The Toronto Star whose advertisement on the back page made printing of the leaflet possible.

Our Telescope Makers Group, under the direction of Mr. Raymond Pearce, was active during the year with about 40 members taking part in the group's activities. Two instruments made by our members were among the six used at the Exhibition. The three-inch refractor donated to the Centre last year by Mr. George T. Dale was also used at the C.N.E., and was in almost constant circulation amongst members during the rest of the year.

The astronomy study course which was developed by a committee headed by Mr. F. Keith Dalton, was officially adopted by the Boy Scout Association during the year and is now in use both by Scouts and Girl Guides preparing for their Astronomy badges.

The list of meetings, held in the McLennan Laboratory of the University of Toronto, except where otherwise noted, follows:

February 12,—"Radio Waves from the Sun and Stars," by Dr. Ralph E. Williamson. (A joint meeting in Convocation Hall with the Royal Canadian Institute.)

February 22,—Members' Night. Two films: "Time" and "Celestial Navigation —The Earth," followed by discussion on "Time, How We Find It and How We Use It" by Mr. R. W. Tanner.

March 8,—"Recent Studies of the Aurora Borealis," by Dr. C. W. Gartlein, Cornell University.

March 22,—Members' Night. "Telescopes—Their Why and How." Discussion and demonstration by Mr. R. E. Pearce and Mr. D. Gerrie.

April 5,—"The Milky Way and Its Mysteries," by Dr. Donald A. MacRae, Warner and Swasey Observatory.

April 12,—Members' Night. Following a brief demonstration on "Eclipses and Occultations," by Miss R. J. Northcott, the Society adjourned to the lawn to observe the total eclipse of the moon.

May 10,—Members' Observation Night on University campus.

June 7, July 5 and August 2,—Public "Star Nights" on University campus.

October 11,—Annual Members' Night at David Dunlap Observatory, Richmond Hill. Addresses by various members of the staff.

October 25,—"Seeing Meteors by Eye, Camera and Radio," by Dr. Peter M. Millman, Dominion Observatory.

November 8,—Film, "The Story of Palomar" in sound and colour.

November 22,—"Exploring the Atmospheres of the Sun and the Earth," by Dr. Leo Goldberg, University of Michigan. Motion pictures.

December 6,—"The Trials of Galileo," by A. R. Clute, K.C., President of the Centre. Followed by Annual Meeting.

FREDERIC L. TROYER, *Secretary.*

OTTAWA CENTRE

The activities of the Centre during 1949 included five general, and two executive meetings, and participation in the meeting of the American Astronomical Society, June 19-23.

All lectures were held in the Assembly Hall of Carleton College:

January 20,—"Radio Waves from Sun and Stars," by Professor Ralph E. Williamson, David Dunlap Observatory.

February 10,—"Radio Observation of Meteors," by Dr. W. R. McKinley.

February 24,—"Hunting the North Magnetic Pole," by Paul H. Serson.

March 10,—"Planetary Atmospheres," by Dr. G. Herzberg.

March 31,—Film Night. Five films were shown; (1) The Solar Family; (2) The Story of the Telescope; (3) Communing with the Heavens; (4) A Kodachrome of a total Lunar eclipse; (5) R.C.A.F. Operation "Eclipse".

During the meeting of the American Astronomical Society members manned the registration desk and many attended the various meetings and the Russell lecture. The annual Open House of the Centre took the form this year of a Garden Party to which the visitors were invited.

Some members assisted in meteor observing during the summer showers.

C. B. HICKS, *Secretary.*

HAMILTON CENTRE

During the year 1949, five regular meetings were held in the Art Gallery, Hamilton, one field night and three regular meetings were held at McMaster University, Hamilton, and eight Council meetings to discuss the business of the Centre.

January 6,—"A Visual Look at our Universe," by W. D. Stewart, B.A. An illustrated lecture based on a set of slides presented to our centre a year ago.

February 3,—"Probing the Most Puzzling Planet," by H. D. Scott, M.A.Sc.

March 3,—"The Magic Mirror," by W. T. Patterson, R.O., Guelph.

April 7,—An evening of moving pictures featuring the film "Solar Prominences," films describing sound waves and the principles of acoustics were also shown.

May 5,—"Why Study Astronomy?" by Mr. B. Wishart. "Measuring the Velocity of Light," by Mr. F. Schneider.

June 2,—Field Night, on the grounds of McMaster University. The proceeds of the field night went towards the purchase of a Spitz Planetarium for McMaster University.

October 6,—"Mechanical Demonstrations of Astronomical Phenomena." by Dr. H. R. Kingston, University of Western Ontario.

November 5.—More than 700 persons were present Saturday evening at McMaster University in Convocation Hall when T. M. Norton officially presented a Spitz Planetarium to the University on behalf of the Hamilton Centre of the Royal Astronomical Society of Canada. Dr. G. P. Gilmour accepted the gift for the University.

December 1,—"Radio Waves from Sun and Stars," by Ralph E. Williamson, Ph.D., David Dunlap Observatory.

Total membership 49, and includes two life members.

GEORGE MURCHIE, *Secretary-Treasurer.*

Victoria Centre

During 1949, six regular meetings of Victoria Centre were held in the Provincial Normal School and Victoria College.

During August a series of five lectures was sponsored by the Society. These meetings were very successful with a record enrollment of 152 people. 15 of these have applied for regular membership privileges with Victoria Centre.

Mrs. J. H. Williams, *Secretary-Treasurer.*

Montreal Centre

During the season, a total of thirteen meetings were held with an average attendance of 102. These meetings included a series of four lectures given by members of our own Centre. Other meetings were addressed by the following speakers: Dr. Frank S. Hogg, Dr. Peter M. Millman, Dr. D. E. Douglas, Dr. W. Bruce Ross, Dr. Cecilia Payne-Gaposchkin, and the Secretary. At one meeting the programme consisted of moving pictures. At the annual meeting the address was given by the President and the final meeting took the form of a social, with moving pictures and a quiz programme.

Through the kindness of Station CFCF, a series of astronomical talks have been given on FM. These have been arranged by Mr. E. Russell Paterson.

The continued co-operation of McGill University, press, and many members and friends who have contributed to the success of the year's programme is deeply appreciated and gratefully acknowledged.

Henry F. Hall, *Secretary.*

Report of Librarian

Montreal

Although books on astronomy and allied subjects are in better supply, the general increase in price and the cost of binding and repairs has resulted in a smaller number being purchased during the current year. This, however, has been considerably offset by generous donations of books or funds for their purchase.

In addition to "Sky and Telescope", the periodical "Scientific American" has been made available for circulation.

The total circulation of books was 346 and periodicals 148.

Books donated to the Library

Centennial Symposia, (Harvard Observatory Monographs)
Modern Ideas of the Atom
Terrestrial and Celestial Albedoes
Harvard College Observatory, 1st Century
A.A.A. Preferred Spelling and Pronunciations.
The Astronomical Horizon
Celestial Objects for Common Telescopes. Vol. I
Between the Planets (Harvard Series) Copy 2.
The Milky Way (Harvard Series) Copy 2
Galaxies (Harvard Series) Copy 2
Our Sun (Harvard Series)
Bartky's Astronomy

Books purchased by the Centre

The Light of the World (For our Children's Section)
Looking at the Moon (For our Children's Section)
Atlas of the Heavens
The Face of the Moon
Newton Tercentenary Celebration
The Atmosphere of the Earth and Planets
Making Your Own Telescope

Books Bound in Permanent Form

Yale Catalog of Bright Stars
R.A.S.C. JOURNAL 1948
Preferred Spelling and Pronunciations A.A.S.
General Instructions for Meteor Observing
Harvard College Observatory - 1st Century
Binder for Vol. VII Sky and Telescope

Books Rebound or Repaired

The Glass Giant of Palomar
Wonder and Glory of the Stars
Picture Book of Astronomy
Physics and Philosophy

Through donations to our Equipment Fund, the Centre was able to purchase a slide projector. The date and place for every time the projector is used is entered on a card.

C. M. GOOD, *Librarian.*

REPORT OF OBSERVATION COMMITTEE

Another very successful year has elapsed as is shown by the attendance and activities recorded in the Centre's files at Ville Marie Observatory. Saturday meetings accounted for 1,176. The total attendance for the year, including special observation meetings and other groups visiting the Observatory was 1,395.

In the field of observation we have the following to report: the Orionid Meteors of October 22, 1948, observed by 18 members. A total of 38 meteors were recorded from 9 p.m. to 1 a.m.

Occultations of stars by the moon were also timed during the year and recorded by Miss Williamson, Mr. Birtles and Mr. Good.

Forty-two members participated in a well-planned programme of observation for the total lunar eclipse of the moon of April 12-13 and a party of 39, including representatives and photographers from the Monitor and the French daily, La Presse, were on hand for the lunar eclipse of October 6-7.

Monthly sun-spot observations were submitted by Messrs. DeKinder, Noseworthy, Morgan and Garneau. Mrs. Wright and Mr. Venor made a series of fine naked-eye observations of sun-spots. The observations were sent to Mr. Heines, Chairman of the Solar Division of the A.A.V.S.O., and to Dr. Nicholson of Mount Wilson Observatory.

Miss Williamson reported 69 displays of the aurora borealis observed by 26 persons, supplying 127 descriptive reports which were sent to Dr. Gartlein of Cornell University.

The Perseid meteor shower was observed on August 12-13 from 10 p.m. to 3 a.m., a total of 227 meteors being recorded and plotted by 28 members.

The Telescope Makers group has also been busy, 15 members being engaged in this undertaking. Mr. Donnelly deserves high praise for the fine work done in grinding and polishing a new 12-inch mirror which he lent to the Society for its telescope while he refigures the original defective one. He also deserves the thanks of the Centre for the slow motion drive and mounting he designed for this reflector.

The annual Star Night event of June 1 in Westmount Park met with great success. Twenty-five telescopes, together with talks, movies and slides drew a record crowd of 2,500 people. Another Star Night, on a smaller scale, was held for the pupils of St. Laurent High School on September 30, with 4 telescopes in operation. Miss Williamson, Messrs. Donnelly, Paul S. Scott, Noseworthy and Good were in charge.

Increased activity has been noted in the Messier Club which now has 28 members. The Asteroid Club for boys and girls under 15 has resumed operation under the leadership of Miss Williamson. Mrs. G. Hall is doing very good work instructing girl guides for their astronomy badges. Mr. F. P. Morgan has continued his study of sun-spot rotations. Thirty variable stars were observed by Mr. Garneau and reports sent to the A.A.V.S.O.

DeLisle Garneau.

London Centre

The London Centre of the Royal Astronomical Society of Canada held seven regular meetings in the Cronyn Memorial Observatory of the University of Western Ontario, and enjoyed one

dinner in the University dining room during the year 1949. Speakers and subjects were as follows:

January 11,—Dinner. "Space Travel," by Dr. J. W. Campbell.
February 18,—"Constellation Orion," by Mr. M. O. Culbert, "Heavenly Nights," by Dr. A. J. Watt, Slides of Astronomical Interest, by Mr. Omar Kilburn.
March 18,—"The Romance of the Telescope," by Dr. H. R. Kingston, "The New Telescope at Mt. Palomar," by Rev. W. G. Colgrove.
April 14,—Slides made by Mr. Parrott, by Dr. A. J. Watt, "The Fourth Dimension," by Mr. R. G. Colgrove.
October 21,—"Destruction," by Mr. E. E. O'Connor, "Discovery of Planet Neptune," by Dr. H. R. Kingston.
November 18,—"Original Astronomical Poetry," by Rev. W. G. Colgrove, "Principles of Parallax," by Dr. R. H. Cole.
November 3,—Trip to McMaster University for formal opening of the Spitz Planetarium.

R. E. WINTERS, *Secretary.*

EDMONTON CENTRE

All regular meetings have been held in Room 142 of the Arts Building through the kindness of the University authorities. The attendance varied from 25 to 42 members and visitors, with an aggregate attendance of 268, which is only 89 per cent of last year.

The Handbook talks were given by Dr. Campbell and Mr. Keeping. Short talks were not available but comments on the Montreal publication "Skyward" were made by Mr. Burt on occasion.

The main papers have been as follows:

December,—"Spiritual Stargazing," by Mr. A. S. Tweedie.
January,—"Chart Slide Selection," by Mr. E. Phibbs.
February,—"The Universe—Whence?," by Dr. J. W. Campbell.
March,—"The Origin of the Solar System," by Mr. E. S. Keeping.
April,—"Cosmic Rays," by Dr. K. B. Newbound.
May,—"The Moon and Geology," by Dr. R. E. Folinsbee.
October,—"Binary Stars," by Mr. E. Phibbs.
November,—"Solar Research," by Dr. E. H. Gowan.

The roll of the Centre now consists of 60 regular members and 1 associate.

E. H. GOWAN, *Honorary Secretary.*

Centre de Quebec

Durant l'année 1949, le Centre de Québec a tenu cinq réunions générales, en plus de la réunion annuelle de ce jour. Le programme préparé pour chacune d'elles peut se résumer ainsi:

Le 16 février,—Réunion conjointe de la Société de Mathématiques et du Centre de Québec. "La Relativité et l'Expérience," par le Dr. Enrico Persico.

Le 26 mars,—"La Réforme du Calendrier," par le R. P. Conrad Morin, O.F.M.

Le 26 juin,—Fête du Soleil, représentation des films "Solar Prominences" et "Explosions on the Sun."

Le 8 octobre,—"Premières observations—Apparences ou Réalités," par M. Jean-Pierre Bernier.

Le 12 novembre,—"Les Systèmes Planétaires," par M. Jean-Pierre Bernier.

Il convient de signaler ici que l'organisation de nos séances générales est maintenant confiée à un comité composé de MM. Claude Frémont, Jean-Pierre Bernier et Gérard Lafontaine.

L'effectif de la Société est passé de 76 à 63 membres, baisse attribuable, semble-t-il, à une règlementation plus sévère dans la perception des cotisations.

La page d'astronomie, publiée chaque semaine dans le Journal *L'Action Catholique,* a absorbé une bonne partie du temps donné par le personnel régulier de la société. La plupart de ces chroniques ont fourni la matière de nos *Feuillets D'Astronomie Populaire,* ce qui a porté à cinquante le nombre de fascicules actuellement en circulation. Par suite de la vente de plus de trois mille copies de ces feuillets, le fonds de réserve du Comité du Télescope s'est enrichi de 275 dollars au cours de l'année écoulée. Un deuxième concours-questionnaire organisé par M. Bernier a réuni quatre-vingt-un participants. Les questions étaient plus difficiles que l'an dernier et les prix plus substantiels également. Le *Graphique du Ciel* constitue un autre moyen d'intéresser le grand public à l'astronomie. L'Académie des Sciences du Maryland, à Baltimore, a bien voulu nous en faire cadeau encore une fois. Enfin, nous sommes heureux d'annoncer que la revision finale du texte français de *Our Wonderful Universe* est sous bonne voie d'être terminée. Notre société se mettra ensuite à la recherche d'un éditeur, ce qui devrait être une tâche facile.

L'observatoire temporaire du Centre de Québec a été ouvert comme d'habitude au public, sauf durant l'absence du directeur. Pour accommoder les nombreux touristes qui visitent les Plaines d'Abraham durant la belle saison, il a été décidé d'ouvrir certains après-midi. Le nombre de visiteurs qui ont signé le registre se chiffre à 1863.

Les taches solaires ont été régulièrement observées à la lunette de 4 pouces. MM. Bernier et Vaillancourt, engagés comme aides à l'observatoire pour la période des vacances, ont procédé au test de la turbulence, et au calcul des occultations. Quatre phases seulement de ces dernières ont pu être chronométrées. M. Georges-Etienne Gagné a continué son étude des cycles de température. Ses observations couvrent maintenant trois années complètes et commencent à donner des résultats intéressants. Des préparatifs ont été faits pour l'observation des deux éclipses de Lune de l'année, mais seulement celle du 6 octobre a pu être observée.

Comme les années dernières, le Centre de Québec a bénéficié de l'aide du Gouvernement Provincial sous forme d'octroi et de prêt de personnel dont les fonctions consistent à maintenir l'observatoire en opération et à participer aux divers travaux de la société. Notre mécène a bien voulu porter à trois, cette année, ce qui a permis à notre secrétaire de faire un voyage d'étude de quatre mois, sans que les travaux de la société en souffrent trop. Le Centre de Québec désire exprimer à son collaborateur fidèle ses meilleurs sentiments de reconnaissance.

PAUL-H. NADEAU, *le secrétaire.*

WINDSOR CENTRE

(Summarized from the Report of the Secretary)

At an executive meeting in January it was decided that the customary current events of the star map type would be given every quarter instead of monthly as had been done in the past. It was felt that this would cover the seasonal skies and would tend to make better use of the telescopes available in Windsor in accordance with the proverb "a picture is worth ten thousand words and doing is worth ten thousand pictures". The talks preceding the main speaker would then be devoted to talks on topics related to current astro-

nomical subjects. This proved to be a move in the right direction as was borne out in later meetings. Many more topics were brought out and discussed than would have been otherwise.

The meetings were held at Willistead Art Gallery, through the courtesy of the Public Library Board. Subjects and speakers follow:

January,—"Sun's Effects on our Ionospheric Layers," by Dr. O. C. Mohler.
February,—"Temporary Stars," by Dr. D. McLaughlin, University of Michigan.
March,—"Chemistry of the Skies," by Mr. L. F. McGee.
April,—"Variable Stars," by Dr. Helen S. Hogg, David Dunlap Observatory.
May,—"Thunder and Lightning," a film by General Electric Company.
June,—Observation meeting at Poplar Lodge of the President. A film and social hour followed.
September,—"Maps and Map Making," by Dr. E. Pleva, University of Western Ontario.
October,—Four University of Chicago films, "Solar and Earth Motions", "The Moon", "The Solar Family" and "Exploring the Universe". Commentary by Dr. Wm. Schultz, Cranbrook Institute of Science.
November,—"The Romance of Parallax," by Judge J. J. Coughlin. The annual meeting and a social hour followed.

HENRY LEE, *Secretary.*

SASKATOON CENTRE

(Summarized from the Report of the Secretary)

The following meetings were held during the spring session:

January 19,—"Interstellar dust and gases," by Dr. Petrie.
February 15,—"A Trip through the Universe," by Mr. Small.
March 17,—"Solar Prominences," a film from the McMath-Hulbert Observatory. Commentary by Dr. Petrie.

R. SMALL, *Recorder.*

CENTRE FRANCAIS DE MONTREAL

Le Centre français de Montréal a tenu quatorze réunions générales au cours de la saison 1948-49.

En décembre 1948, notre Centre, conjointement avec l'Association canadienne-française pour l'Avancement des Sciences, a présenté monsieur Valéry Giscard D'Estaing, ingénieur diplômé de l'Ecole Polytechnique de Paris, dans une série de cinq conférences publiques.

Le 2 décembre,—"Univers 1948".
Le 10 décembre,—"La physique du monde solaire".
Le 14 décembre,—"Connaissance des étoiles".
Le 15 décembre,—" Les étoiles variables et les sources d'energie stellaire".
Le 17 décembre,—"L'evolution de l'univers".

La première fut donée dans le grand amphithéâtre de l'Ecole Polytechnique de Montréal, où un auditoire de 350 personnes avaient répondu à notre invitation. Les autres, plus techniques, préparées pour un auditoire spécialisé, furent données dans une salle de l'Université de Montréal et suivies par plusieurs membres de notre Société, en plus des étudiants et professeurs de l'Université.

Le 7 décembre,—"La mechanique du monde solaire," par M. D'Estraing.
Le 13 janvier,—"Les lois de Kepler et les inexactitudes astronomiques de Victor Hugo," par le révérend Frère Robert.
Le 3 février,—"Le systeme solaire," par M. F. de Kinder.
Le 24 février,—"La géologie de Montréal," par M. Marcel Tiphane.
Le 17 mars,—"Chateaubriand et l'Astronomie," par le révérend Frère Robert, suivie d'un film sonore de court metage sur l'astronomie.
Le 31 mars,—"La maniere de fabriquer un telescope reflecteur," par M. Jean Naubert.
Le 12 avril,—L'éclipse totale de la Lune a fourni une occasion favorable de convier nos membres à observer le ciel en groupe. Plusieurs lunettes et télescopes étaient à la disposition du public. Le révérend Frère Robert, f.e.c., a donné des explications sur le phénomène avant l'observation. Au cours de la soirée, monsieur J.-Edgar Guimont a suivi et noté toutes les phases de l'éclipse.
Le 21 avril,—à l'Ecole Polytechnique, nous avons vu un film en couleurs sur l'ascension du mont McKinley, gracieusement présenté par monsieur W. Bradford Washburn, directeur du musée scientifique de Boston.
Le 5 mai,—"Glaciation et Astronomie," par le révérend Père Leo Morin, c.s.c.
Le 7 juin,—L'observation du ciel à ville LaSalle. Les membres du Centre anglais se joignaient a leurs collegues du Centre français.

Le Conseil s'est réuni à plusieurs reprises à son siège officiel, c'est-à-dire à la bibliothèque de l'Ecole Polytechnique. Le Conseil s'est rendu chez monsieur J.-Edgar Guimont, l'un de nos directeurs, par deux fois, pour visiter son imposante bibliothèque sur l'astronomie, lors d'une soirée intime, et pour assister à une démonstration, par monsieur Jean Naubert, du test de Foucault sur les miroirs paraboliques.

Dans le cours de l'année, la Société a jugé un concours ouvert aux jeunes naturalistes. Les travaux présentés par des garçons et filles de 12 à 16 ans manifestaient un intérêt réel pour l'astronomie, preuve de l'attrait que peut exercer l'astronomie sur tous les âges et sur toutes les classes.

Membres—Le nombre de nos adhérents s'est maintenu ferms puisque nous comptons 47 membres réguliers pour l'année écoulée.

JOSEPH R. LEDUC, *secrétaire-trésorier.*

FINANCIAL STATEMENT, 1949

I. GENERAL TREASURER

GENERAL ACCOUNT

RECEIPTS

(Corrected) Balance December 31, 1948		$ 70.73
Grants—Canada	$2,000.00	
Ontario	500.00	
Fees from Centres	2,921.13	
Fees from General Members	715.46	
Subscriptions	403.73	
Observer's Handbooks	1,045.30	
Publications	1,298.50	
Advertising	128.00	
Interest (Life Members Bonds)	38.63	
Premiums and Exchange (Net)	5.65	9,056.40
		$9,127.13

DISBURSEMENTS

Publications	$4,579.16	
Grants to Centres	1,298.50	
Salaries	1,395.00	
Rent	440.00	
Light	9.63	
Stamps	210.40	
Office Printing and Stationery	50.75	
Stencils	38.14	
Public Meeting	154.13	
General	28.79	$8,204.50
Balance		$ 922.63

Accounts Payable—Journals:			
July-August	$500.85		
Sept.-October	563.43	$1,064.28	
Accounts Receivable:		162.25	902.03
True Balance:			$ 20.60

LIFE MEMBERSHIP ACCOUNT

Bank Balance December 31, 1948	$ 268.61	
Receipts		
Donation	15.00	
Life Members Fees	160.00	
Balance December 31, 1949		$ 443.61

BUILDING FUND ACCOUNT

Bank Balance December 31, 1948	$ 788.96	
Receipts		
Interest	184.88	
Balance December 31, 1949		$ 973.84

SOUTHAM PRESS FUND

Bank Balance December 31, 1948	$ 199.29	
Receipts		
Called Bond	100.00	
Interest	58.62	$ 357.91
Disbursements		
Bank Charges—Bond Safekeeping	8.55	
Chant Medal	11.48	20.03
Balance December 31, 1949		$ 337.88

BONDS AND DEBENTURES HELD BY R.A.S.C. AT IMPERIAL BANK

Account	Brought fwd.	Called	Carried fwd.	Yearly interest
Life Members	$1,300.00		$1,300.00	$ 38.63
Building Fund	6,200.00		6,200.00	184.88
Southam Press Fund	2,050.00	$100.00	1,950.00	58.62
			$9,450.00	$282.13

J. H. Horning, *General Treasurer.*

II. REPORTS OF THE TREASURES OF CENTRES

TORONTO CENTRE

Receipts		Disbursements	
Balance carried forward	$272.65	Rentals	$ 39.03
Grant from General Council	434.50	Postage, stationery and printing	76.16
		Expenses re meetings	193.89
		Balance carried forward	398.07
	$707.15		$707.15

Special Purpose Account

Receipts		Disbursements	
Balance carried forward	$333.53	Insurance on instruments at Exhibition	$ 9.00
Fee from astronomical services at Canadian National Exhibition	150.00	Balance carried forward	474.53
	$483.53		$483.53

T. H. Mason, *Treasurer.*

OTTAWA CENTRE

Receipts		Disbursements	
Balance from previous year	$ 15.62	Fees to General Treasurer	$205.00
Members' fees	205.00	Stationery	3.61
Grant from General Council	74.00	Postage	17.18
Donations	10.00	Expenses re meetings	301.48
Bank interest	.37	Exchange on cheques and money orders	1.34
Proceeds of meetings	246.75	Cost of Handbooks	40.00
Sale of Handbooks	40.85	Balance carried forward	23.80
	$592.59		$592.59

S. A. Mott, *Treasurer.*

HAMILTON CENTRE

Receipts		Disbursements	
Balance from previous year	$ 44.18	Rent	$ 12.50
Members' fees	118.00	Fees to General Treasurer	147.00
Grant from General Council	58.00	Stationery	.90
Donations	2.00	Postage	7.00
Bank interest	.27	Printing	13.48
Dues in advance	18.00	Expense re meetings	9.35
		Exchange on cheques	.30
		Miscellaneous	12.60
		Balance carried forward	$ 37.32
	$240.45		$240.45

George Murchie, *Treasurer.*

WINNIPEG CENTRE

Receipts		Disbursements	
Balance from previous year	$ 70.27	Fees to General Treasurer	$ 67.00
Members' fees	67.00	Stationery	6.44
Grant from General Council	43.00	Postage	5.00
Bank interest	1.06	Expense re meetings	3.00
		Exchange on cheques	.15
		Miscellaneous	.25
		Balance carried forward	$ 99.49
	$181.33		$181.33

Margaret E. Watterson, *Treasurer.*

VICTORIA CENTRE

Receipts		Disbursements	
Balance from previous year	$234.97	Rent	$ 30.00
Members' fees	287.00	Fees to General Treasurer	292.00
Grant from General Council	81.00	Stationery	26.18
Donations	10.00	Postage	13.00
Librarian	6.13	Expense re meetings	.29
Interest	4.16	Exchange on cheques	1.35
Summer Course profit	84.65	Miscellaneous	44.98
		Balance carried forward	300.11
	$707.91		$707.91

Number of Junior Members included in this report: 12

Mrs. J. H. Williams, *Treasurer.*

MONTREAL CENTRE

Receipts			Disbursements	
Balance from 1948		$216.51	Rent	$ 76.00
Members Fees 1 Life, 239 Annual		753.00	Fees to General Treasurer	753.00
Grant from General Council		276.00	Stationery	46.89
Donations			Postage	70.45
Library	$ 16.00		Library	49.75
Equipment	15.00		Expenses re meetings	120.92
General	140.00	171.00	Exchange on cheques	.84
Bank interest		2.67	Miscellaneous	.50
Members' Subscriptions to McGill Campaign		26.00	Equipment	77.33
			Star Night	14.87
			Subscription McGill Fund (Incl. $26.00 from members)	35.00
			Balance carried forward	199.63
		$1,445.18		$1,445.18

C. N. S. Yarnell, *Treasurer.*

LONDON CENTRE

Receipts		Disbursements	
Balance from previous year	$121.72	Fees to General Treasurer	$ 84.00
Members' fees	116.00	Stationery	1.00
Grant from General Council	42.00	Postage	4.78
Bank interest	.62	Printing	3.72
		Expense re meetings	10.00
		Exchange on cheques	.33
		Miscellaneous	1.50
		Balance carried forward	175.01
	$280.34		$280.34

R. E. Winters, *Treasurer.*

VANCOUVER CENTRE

Receipts		Disbursements	
Balance from previous year	$ 10.80	Fees to General Treasurer	114.00
Members' fees	114.00	Stationery	21.13
Grant from General Council	55.50	Postage	12.00
Bank interest	.27	Expense re meetings	30.30
Bank service charge reversed	.25	Exchange on cheques	.15
		Miscellaneous	1.46
		Service charge at bank	.75
		Balance carried forward	1.03
	$180.82		$180.82

(Miss) G. W. Owen, *Treasurer.*

EDMONTON CENTRE

Receipts		Disbursements	
Balance from previous year	$ 49.49	Fees to General Treasurer	$ 2.55
Members' fees	158.00	Stationery, postage	12.00
Grant from General Council	61.85	Expense re meetings	25.60
Donations	4.00	General Council	164.00
Interest	1.25	Balance carried forward	70.44
	$274.59		$274.59

(Miss) A. M. P. Smith, *Treasurer.*

QUEBEC CENTRE

Receipts		Disbursements	
Balance from previous year	$ 50.13	Fees to General Treasurer	186.00
Members' fees	173.15	Stationery	26.96
Grant from General Council	76.00	Postage	54.48
Donations	65.25	Printing	22.39
Grant from Prov. Government	300.00	Expense re meetings	20.42
Miscellaneous	2.36	Miscellaneous	114.05
		Observatory	98.29
		Balance carried forward	144.30
	$666.89		$666.89

Paul-H. Nadeau, *Treasurer.*

WINDSOR CENTRE

Receipts		Disbursements	
Balance from previous year	$ 33.03	Fees to General Treasurer	$139.00
Members' fees	133.00	Stationery	12.30
Grant from General Council	36.50	Postage	6.68
Bank interest	.42	Expense re meetings	15.48
		Exchange on cheques	.18
		Balance carried forward	29.31
	$202.95		$202.95

Number of Junior Members included in this report: 5

Jack Evzovitch, *Treasurer.*

GUELPH CENTRE

Receipts		Disbursements	
Members' fees	$ 96.00	Fees to General Treasurer	$ 96.00
Grant from General Council	32.00	Stationery	.60
		Postage	.68
		Printing notices	21.58
		Exchange on cheques	.15
		Miscellaneous	.76
		Deficit 1948 (reported in error as $3.63 in 1948 report)	4.63
		Balance carried forward	3.60
	$128.00		$128.00

S. B. MacKay, *Treasurer.*

SASKATOON CENTRE

Receipts		Disbursements	
Balance from previous year	$ 72.85	Fees to General Treasurer	$ 74.13
Members' fees	40.00	Postage	2.00
Interest	.39	Expense re meetings	3.00
		Miscellaneous	.26
		Balance carried forward	33.85
	$113.24		$113.24

R. E. Jensen, *Treasurer.*

CENTRE FRANCAIS DE MONTREAL

Receipts		Disbursements	
Balance from previous year	$ 55.53	Fees to General Treasurer	$141.50
Members' fees	141.50	Stationery	8.16
Grant from General Council	28.00	Postage	9.78
Donations	5.00	Printing	4.76
Profits on sale of books	4.16	Expense re meetings	33.91
		Miscellaneous	8.15
		Balance carried forward	27.93
	$234.19		$234.19

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OUT OF OLD BOOKS

By Helen Sawyer Hogg

Charles Babbage and the Calculating Machine*

Probably no device has saved as much time for astronomers as has the computing machine. During the present decade, when many newspapers and magazines contain references to the amazing development o electronic computing machines, it is interesting to think back to the early development of this instrument.

The first beginnings of the calculating machine are represented by the abacus, developed many centuries ago, and still in efficient use principally in the countries of or near the Orient. In the early 17th century John Napier developed a set of numbering rods, popularly referred to as Napier's bones, for multiplying numbers. The invention of the first real calculating machine, in the accepted use of the term, an adding machine operated by turning wheels, and in which the result appeared in sight holes as in the modern machine, is attributed to Blaise Pascal in 1642. The first such machine to be produced on a commercial scale was developed by Charles Thomas of Alsace in 1820.

The importance of Charles Babbage is that in the early nineteenth century he conceived the notion of a calculating machine of a very different type from the existing ones, and one which is the basis for the elaborate computing machines of the present day. An English mathematician and mechanician of the highest skill, Babbage was born in Teignmouth in 1792, and died in 1871, the same year as his life-long friend Sir John Herschel. The volume of the *Monthly Notices* (vol. 32, page 101) which contains the obituary notices of both of these men states:

> Sir John Herschel and Mr. Babbage were the last survivors of the small band of scientific men who met together at the Freemasons' Tavern on January 12th, 1820, "to take into consideration the propriety and expediency of establishing a Society for the encouragement and promotion of astronomy," a meeting which resulted in the foundation of the Royal Astronomical Society.

*I am indebted to Dr. Harlow Shapley for suggesting that Babbage's book, *Passages from the Life of a Philosopher*, would be interesting material for this column.

Not merely was Babbage one of the founders of this society, but he was the first to receive its gold medal, in 1824.

Babbage conceived the idea of constructing a machine which would calculate and print mathematical tables such as logarithms. For this purpose he employed the principle of differences, and hence referred to his first machine as a difference engine. The story of his years of struggles and tribulations is told in his remarkable book, *Passages from the Life of a Philosopher*, 1864. As well as telling of Babbage's development of the difference engine, the book recounts many amusing incidents in his life with fine humour, but also reflects the bitterness which he felt when his difference engine failed to receive its due support and recognition. I am indebted to Dr. C. A. Chant for the use of his personal copy of this scarce book, which was presented to him by Mr. Richard Babbage of Montreal, a great grandson of the author.

We quote from Chapter V of this volume, which tells how the idea of the difference engine came to Babbage, and how he developed it.

CHAPTER V.

DIFFERENCE ENGINE No. 1.

CALCULATING MACHINES comprise various pieces of mechanism for assisting the human mind in executing the operations of arithmetic. Some few of these perform the whole operation without any mental attention when once the given numbers have been put into the machine.

Others require a moderate portion of mental attention: these latter are generally of much simpler construction than the former, and it may also be added, are less useful.

The simplest way of deciding to which of these two classes any calculating machine belongs is to ask its maker—Whether, when the numbers on which it is to operate are placed in the instrument, it is capable of arriving at its result by the mere motion of a spring, a descending weight, or any other constant force? If the answer be in the affirmative, the machine is really automatic; if otherwise, it is not self-acting.

Of the various machines I have had occasion to examine, many of those for Addition and Subtraction have been found to be automatic. Of machines for Multiplication and Division, which have fully come under my examination, I cannot at present recall one to my memory as absolutely fulfilling this condition.

The earliest idea that I can trace in my own mind of calculating arithmetical Tables by machinery arose in this manner:—

One evening I was sitting in the rooms of the Analytical Society, at Cambridge, my head leaning forward on the Table in a kind of dreamy mood, with a Table of logarithms lying open before me. Another member, coming into the room, and seeing me half asleep, called out, "Well, Babbage, what are you dreaming about?" to which I replied, "I am thinking that all these Tables (pointing to the logarithms) might be calculated by machinery."

I am indebted to my friend, the Rev. Dr. Robinson, the Master of the Temple, for this anecdote. The event must have happened either in 1812 or 1813.

About 1819 I was occupied with devising means for accurately dividing astronomical instruments, and had arrived at a plan which I thought was likely to succeed perfectly. I had also at that time been speculating about making machinery to compute arithmetical Tables.

One morning I called upon the late Dr. Wollaston, to consult him about my plan for dividing instruments. On talking over the matter, it turned out that my system was exactly that which had been described by the Duke de Chaulnes, in the Memoirs of the French Academy of Sciences, about fifty or sixty years before. I then mentioned my other idea of computing Tables by machinery, which Dr. Wollaston thought a more promising subject.

I considered that a machine to execute the mere isolated operations of arithmetic, would be comparatively of little value, unless it were very easily set to do its work, and unless it executed not only accurately, but with great rapidity, whatever it was required to do.

On the other hand, the method of differences supplied a general principle by which *all* Tables might be computed through limited intervals, by one uniform process. Again, the method of differences required the use of mechanism for Addition only. In order, however, to insure accuracy in the printed Tables, it was necessary that the machine which computed Tables should also set them up in type, or else supply a mould in which stereotype plates of those Tables could be cast.

I now began to sketch out arrangements for accomplishing the several partial processes which were required. The arithmetical part must consist of two distinct processes—the power of adding one digit to another, and also of carrying the tens to the next digit, if it should be necessary.

The first idea was, naturally, to add each digit successively. This, however, would occupy much time if the numbers added together consisted of many places of figures.

The next step was to add all the digits of the two numbers each to each at the same instant, but reserving a certain mechanical memorandum, wherever a carriage became due. These carriages were then to be executed successively.

Having made various drawings, I now began to make models of some portions of the machine, to see how they would act. Each number was to be expressed upon wheels placed upon an axis; there being one wheel for each figure in the number operated upon.

Having arrived at a certain point in my progress, it became necessary to have teeth of a peculiar form cut upon these wheels. As my own lathe was not fit for this job, I took the wheels to a wheel-cutter at Lambeth, to whom I carefully conveyed my instructions, leaving with him a drawing as his guide.

These wheels arrived late one night, and the next morning I began putting them in action with my other mechanism, when, to my utter astonishment, I found they were quite unfit for their task. I examined the shape of their teeth, compared them with those in the drawings, and found they agreed perfectly; yet they could not perform their intended work. I had been so certain of the truth of my previous reasoning, that I now began to be somewhat uneasy. I reflected that, if the reasoning about which I had been so certain should prove to have been really fallacious, I could then no longer trust the power of my own reason. I therefore went over with my wheels to the artist who had formed the teeth, in order that I might arrive at some explanation of this extraordinary contradiction.

On conferring with him, it turned out that, when he had understood fully the peculiar form of the teeth of wheels, he discovered that his wheel-cutting engine had not got amongst its divisions that precise number which I had required. He therefore had asked me whether another number, which his machine possessed, would not equally answer my object. I had inadvertently replied in the affirmative. He then made arrangements for the precise number of teeth I required; and the new wheels performed their expected duty perfectly. . . . . .

The first Difference Engine with which I am acquainted comprised a few figures, and was made by myself, between 1820 and June 1822. It consisted of from six to eight figures. A much larger and more perfect engine was subsequently commenced in 1823 for the Government.

It was proposed that this latter Difference Engine should have six orders of differences, each consisting of about twenty places of figures, and also that it should print the Tables it computed.

The small portion of it which was placed in the International Exhibition of 1862 was put together nearly thirty years ago. It was accompanied by various parts intended to enable it to print the results it calculated, either as a single copy on paper—or by putting together moveable types—or by stereotype plates taken from moulds punched by the machine—or from copper plates impressed by it. The parts necessary for the execution of each of these processes were made, but these were not at that time attached to the calculating part of the machine.

A considerable number of the parts by which the printing was to be accomplished, as also several specimens of portions of tables punched on copper, and of stereotype moulds, were exhibited in a glass case adjacent to the Engine.

Before the difference engine had been finally completed, Babbage developed an idea for a much more complicated engine, an analytical engine, which was based on the principle of the Jacquard loom, which "is capable of weaving any design which the imagination of man may conceive." At this stage, the government had already contributed about 17,000 pounds towards the difference engine, and Babbage had spent about 20,000 pounds of his own personal

fortune. In this connection we mention an amusing incident of a meeting of Babbage with an emissary from China. He was told that the Chinese were most anxious to know whether the machine would go into the pocket. Babbage told the emissary that he might safely assure his friends in the Celestial Empire that it was in every sense of the word an *out-of-pocket* machine.

One can hardly wonder that governmental authorities were loathe, before the difference engine was completed, to undertake to finance a much more complicated machine, one so complex that even Babbage could interpret his own drawings only with difficulty. Each operation of the analytical engine required two sets of perforated cards, one with the formula to be developed, and the other with conditions pertaining to it. Of the analytical engine, Babbage says (page 145):

> Finally, to whatever degree of simplicity I may at last have reduced the Analytical Engine, the course through which I arrived at it was the most entangled and perplexed which probably ever occupied the human mind.

Though Babbage's request for additional funds was strongly sponsored by leading scientists, the Chancellor of the Exchequer finally refused to grant more funds. There was in the government no real provision for proper consideration of such a scientific question. An example of the lack of understanding of Babbage's project by members of the House is given in the following incident (page 67):

> On two occasions I have been asked,—"Pray, Mr. Babbage, if you put into the machine wrong figures, will the right answers come out?" In one case a member of the Upper, and in the other a member of the Lower, House put this question. I am not able rightly to apprehend the kind of confusion of ideas that could provoke such a question.

Babbage's disappointment at the lack of governmental support is reflected when he says of the difference engine:

> It can not only calculate the millions the ex-Chancellor of the Exchequer squandered, but it can deal with the smallest quantities.

The following incident (page 193), is an excellent illustration of Babbage's keen sense of humour, recording a conversation he had with the poet Samuel Rogers:

Once at a large dinner party, Mr. Rogers was speaking of an inconvenience arising from the custom, then commencing, of having windows formed of one large sheet of plate-glass. He said that a short time ago he sat at dinner with his back to one of these single panes of plate-glass: it appeared to him that the window was wide open, and such was the force of imagination, that he actually caught cold.

It so happened that I was sitting just opposite to the poet. Hearing this remark, I immediately said, "Dear me, how odd it is, Mr. Rogers, that you and I should make such a very different use of the faculty of imagination. When I go to the house of a friend in the country, and unexpectedly remain for the night, having no night-cap, I should naturally catch cold. But by tying a bit of pack-thread tightly round my head, I go to sleep imagining that I have a night-cap on; consequently I catch no cold at all." This sally produced much amusement in all around, who supposed I had improvised it; but, odd as it may appear, it is a practice I have often resorted to. Mr. Rogers, who knew full well the respect and regard I had for him, saw at once that I was relating a simple fact, and joined cordially in the merriment it excited.

One of the greatest plagues of Babbage's life was the incessant playing of street music near his house. Although there was a law prohibiting such, it was not enforced and street music was a real problem to people who were annoyed by it. Babbage estimated that a quarter of his time was wasted by its interminable distraction. Actually he spent several dozen pounds a year in having the offended musicians arrested and brought into court, and used much of his energy trying to stamp out the nuisance. Possibly this resulted in an even greater concentration of street music around his residence.

Such are some of the aspects in the life of a really great man. His obituary notice (*op. cit.*) states:

It is impossible in a small compass to give an adequate estimate of such an intellect. Its salient features were universality, grasp, method, patience. What do not these four qualities, inspired by intense love of truth and never-flagging enthusiasm, and sustained by enormous power of work, imply?--All careers were open to such a man. In any he must have succeeded.--It is as a scientific mechanician that Babbage will hereafter, no doubt, be regarded. In this field he had no equal. The combination of the highest mathematical genius with a lofty and vivid imagination, and the power of descending to the most minute details of technical construction, has never been observed in the same degree, and well-balanced harmony of proportion, as in Babbage.

NOTES AND QUERIES

Astronomical League Convention

The Astronomical League announces that the 1950 convention will be held at Wellesley College, Wellesley, Massachusetts, July 1-4. The program begins with an informal open house at Harvard Observatory at Cambridge at 3 p.m. on Saturday, July 1.

The convention sessions will include observational work for amateurs; variable and double stars; solar, aurora, occultation and meteor observing; lunar and planetary observing and an instruments section.

Dr. William A. Calder, Agnes Scott College, Decatur, Georgia, will be speaker at the convention banquet on Monday evening. On Tuesday, July 4, a field trip will be made to Harvard's Oak Ridge Station and to the new Boston Museum of Science where there is a Spitz Planetarium. Another highlight of the convention will be the "Panel of Experts" expected to include several well known Harvard astronomers. There will also be an exhibit of photographs, charts, diagrams, instruments and accessories.

The Whitin Observatory at Wellesley will be open from 9 until midnight on July 1, 2 and 3 and an Outdoor School for Observers will be held.

Accommodations will be provided in Tower Court at Wellesley College. These include three nights' lodging beginning Saturday evening, July 1, and ending Tuesday morning, July 4, three meals Sunday, three meals Monday and breakfast Tuesday. The basic charge for this is $15 per person plus $1 for the convention registration fee, provided that a 5 dollar deposit is placed and registration is made before April 1. Checks and money orders should be made payable to the Bond Astronomical Club. Registrations made subsequent to April 1 will be slightly higher in cost. Reservations will be accepted until the Wellesley College accommodations are filled to capacity, and those received thereafter will be returned.

Charles A. Federer, Jr.
Harvard College Observatory.

The Romance of Computation

In the field of mathematics there are two well known constants, usually denoted by the Greek letter π and the italic letter e. The former is the ratio of the circumference of a circle to its diameter; the symbol π was given to it by Euler about 1748. The other constant is the base of the system of natural logarithms.

Each of these quatities can be expressed as the sum of an infinite series, and of course the greater the number of terms used in computing the sum, the more accurate is the result. The present writer, many years ago, was highly impressed when he read, in the text-book on Trigonometry he was then using in the high-school, the statement that a man named Shanks had actually computed the value of π out to 707 decimal places!

Of course this record has been far exceeded by using modern computing machines. In a letter which appeared in the February issue of the new handsome and interesting *Scientific American* D. J. X. Montgomery of the Ballistic Research Laboratories at the Aberdeen Proving Ground, Maryland, gives some interesting information.

During the week-end of July 4 a group of four operators of the ENIAC (Electronic Numerical Integration and Calculator) machine at Aberdeen, computed e to a total of 2012 places. And during the Labour Day week-end, in seventy hours of running-time of the machine, they computed π to 2035 decimal places.

These results constitute a wonderful testimony to the efficiency of the modern machines, but it is even more pleasing to learn that these incidental and purely mathematical computations had sufficient interest to four young mathematicians to lead them to devote two summer holiday week-ends for the mental satisfaction of obtaining these results.

C.A.C.

Solar Eclipse Party, 1952

Mr. James Hargreaves, 6 Osborne St., Ottawa, is now making preliminary plans for observing the eclipse of the sun in 1952. He would be glad to hear from members of any Centre of the Royal Astronomical Society of Canada who would care to join him or to assist in any way.

MEETINGS OF THE SOCIETY

AT OTTAWA

December 2, 1949.—The annual dinner meeting of the Ottawa Centre took place on December 2, 1949; approximately 110 members and friends were present.

The Secretary's report showed that five public meetings were held during 1949, that members had assisted during the meeting of the American Astronomical Society in June, and that some members had helped in meteor observing during the summer showers. The Treasurer's report showed that the Centre's finances were slightly improved but still indicated the need for economy. Five new members were welcomed to the society: Dr. J. L. Locke; Miss M. A. McKee; Dr. J. A. Rottenberg; Mr. D. Whittemore; and Mr. R. H. Picher.

The President read an announcement from Mr. James Hargreaves concerning his plans to view the 1952 eclipse. Mr. Hargreaves would like to hear from anyone who would care to join him or assist in any way.

The scrutineers Don. Whittemore and Earl Webb then gave the results of the balloting. The slate of officers for 1950 is as printed elsewhere in this JOURNAL.

On a motion of Dr. MacLulich, seconded by Dr. Herzberg, the secretary was instructed to write letters of thanks to Dr. MacOdrum President of Carleton College for the use of their lecture hall; and to Dr. Archibald of the Experimental FaFrm for the use of the Cafeteria for the annual dinner.

The business meeting was followed by a song film from the National Film oard and the film "The Story Of Palomar", the official Kodacolor film of the California Institute of Technology.

CAROLINE B. HICKS, *Secretary.*

AT SASKATOON

January 19, 1949.—The entire evening was devoted to the description and demonstration of the properties of interstellar dust and gases upon light. Dr. Petrie began the lecture by describing well known interstellar systems known by their effect upon starlight. Demonstrations illustrating the reddening effect of dust particles upon light, the diffraction of light by very small particles, and the luminosity of gases under ultra-violet radiation were given. These studies, with many others, provided an unusual and most interesting lecture. Mr. Irwin thanked Dr. Petrie for his enjoybale lecture and adjourned the meeting.

February 15, 1949.—Mr. Small of the center addressed the group on the topic of "A Trip Through The Universe", which considered the groupings of stars. Starting the description with the sun as an example of a star, the variable stars, in particular the Cephuds, as a means of finding interstellar distances, were noted. Having the signals of the variables as a guide, the star clusters were found to be a key to the structure of the Milky Way. Leaving our Milky Way, a spiral galaxy, the trip ended in outer space with a glimpse of the nearest galaxies of the universe.

March 17, 1949.—The last meeting of the center for the spring was devoted to a film made by the McMath-Hulbert Observtaory during a study of solar prominences. The film showed eruptive and quiescent prominences in hydrogen and calcium light. Dr. Petrie gave a background explanation before and after the film so that a greater appreciation of the phenomenon could be gained by all. The meeting adjourned after a short film upon the nature of light.

R. SMALL, *Recorder.*

AT EDMONTON

October 13, 1949.—The meeting wsa called to order at 8:21 by the President. The minutes of the previous meeting were read and approved. The arrangements for the annual dinner were discussed and na expression of opinion was asked. Mr. Herbert Story, 11046-85 Avenue, was elected a member in the Society. Several of the bulletins from the Montreal Centre were summarized for the meetlng by Mr. Burt. The Handbook talk was given by Dr. Campbell who gave the annual explanation of harvest and hunters' moons. Dr. Campbell also told the meeting about the new magnetic clutch for the telescope drive. This was designed by Professor Harle and Mr. Ron Phillips and is now in use. Appreciation was expressed by the members of the meeting for this kindness.

The main paper of the evening on the subject "Binary Stars" was given by Mr. E. Phibbs of the Mathematics Department. Early doubles observed with the naked eye were about 14 minutes of arc apart. But much closer ones can now be observed with the telescope. They were first thought due to line of sight coincidence, but the possibility of a physical connection between two such stars followed from the ideas of Copernicus. This possibility was made more likely by the discovery of Kepler's Three Laws and then was given a theoretical basis by Newton. Calcultaions on what should be observed agree whenever a check by observation can be made. Herschel gave a basis for the classification into real doubles, now called binary stars, and line of sight doubles.

The law of gravitation enables the mass to be found and also the parallax. From this the absolute magnitude can be found and the mass-luminosity relationship follows and cna be shown by a smooth curve. This relationship, though only measured for binaries, has been assumed to hold for all stars. Observations have been extended by spectroscope and Doppler effect to more distant binaries, that is—from 300 light-years to nearly 6,000 light-years. A special class of eclipsing binaries makes it possible to find also the inclination and size of the orbit as well as the sizes of the component stars themselves. Hence the densities can be found.

Since the paper was long, the meeting had to be adjourned without discussion and questions at 10:08 and the members went to room A111 for the usual refreshments and informal discussion. There were 36 members and visitors present.

E. H. GOWAN, *Honorary Secretary.*

The Royal Astronomical Society of Canada

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